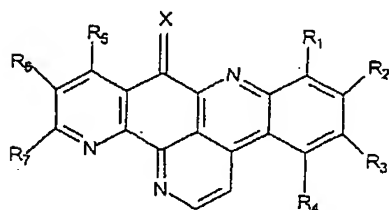
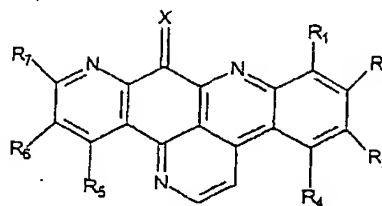


## CLAIMS

1. A pharmaceutical composition comprising an effective amount of a compound chosen from the compounds of general formulae I and Ia below for treating, by virtue of their cytotoxic properties, cancerous tumors and their metastases:



Formula I



Formula Ia

in which:

- X is chosen from oxygen, an =NH group and an =N-OH group,

- R<sub>1</sub> is chosen from hydrogen, halogens, a nitro group and groups -NR<sub>8</sub>R<sub>9</sub> in which R<sub>8</sub> and R<sub>9</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,

- R<sub>2</sub> is chosen from hydrogen and halogens,

- R<sub>3</sub> is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenylalkyl groups and groups -(CH<sub>2</sub>)<sub>n</sub>-Y with Y being chosen from halogens and CN, -CH(O-Et)<sub>2</sub>, (C<sub>1</sub>-C<sub>6</sub>) alkoxy, -O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> and -N(CH<sub>3</sub>)<sub>2</sub> groups and n = 1 to 3,

- R<sub>4</sub> is chosen from hydrogen, halogens, nitro groups and groups -NR<sub>12</sub>R<sub>13</sub> in which R<sub>12</sub> and R<sub>13</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,

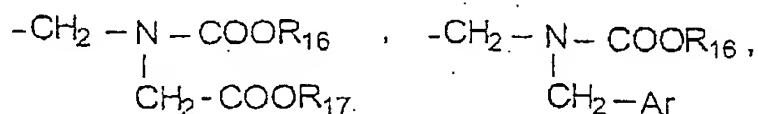
- R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are chosen from:  
hydrogen or a halogen atom,

AMENDED SHEET

C<sub>1</sub>-C<sub>6</sub> alkyl, hydroxyl, C<sub>1</sub>-C<sub>6</sub> alkoxy,  
 (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyloxy-  
 (C<sub>1</sub>-C<sub>4</sub>)alkyl, -CHO, -COOH, -CN, -CO<sub>2</sub>R<sub>14</sub>, -CONHR<sub>14</sub>  
 and -CONR<sub>14</sub>R<sub>15</sub> groups, -NHCOR<sub>14</sub> and -NR<sub>14</sub>R<sub>15</sub> in which  
 5 R<sub>14</sub> and R<sub>15</sub> are chosen, independently of each  
 other, from hydrogen and (C<sub>1</sub>-C<sub>6</sub>) alkyl, -phenyl-CO-  
 CH<sub>3</sub> and -CH<sub>2</sub>-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,

-phenyl-CO-CH<sub>3</sub> or -phenyl-CO-CH=CH-  
 N(CH<sub>3</sub>)<sub>2</sub>, morpholino, nitro or SO<sub>3</sub>H groups,

10 groups:



R<sub>16</sub> and R<sub>17</sub> being chosen from C<sub>1</sub>-C<sub>6</sub> alkyl groups and  
 Ar being a C<sub>6</sub>-C<sub>14</sub> aryl group,

15 with the exclusion of the compounds of formula I  
 containing the combination:

X = O,  
 and, either : R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>,  
 R<sub>7</sub> = H,

20 or : R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H and  
 R<sub>2</sub> = Br,

or R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>5</sub> = OH

and with the exclusion of the compound formula Ia  
 containing the combination X = O and R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>,  
 25 R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H,

and the addition salts of these compounds  
 with pharmaceutically acceptable acids.

2. A pharmaceutical composition comprising an  
 30 effective amount of a compound chosen from the  
 compounds of formula I in which:

- X is chosen from oxygen, an =NH group  
 and an =N-OH group,

- R<sub>1</sub> is chosen from hydrogen, halogens, a  
 35 nitro group and groups -NR<sub>8</sub>R<sub>9</sub> in which R<sub>8</sub> and R<sub>9</sub>

are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,

- R<sub>2</sub> is chosen from hydrogen and halogens,

- R<sub>3</sub> is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenyl-alkyl, -(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub>, and -(CH<sub>2</sub>)<sub>2</sub>-O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,

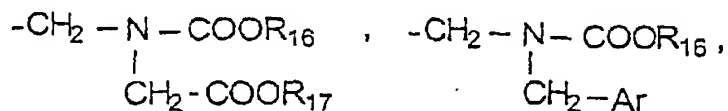
- R<sub>4</sub> is chosen from hydrogen, halogens, nitro groups and groups -NR<sub>12</sub>R<sub>13</sub> in which R<sub>12</sub> and R<sub>13</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,

- R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are chosen from:

hydrogen or a halogen atom,

C<sub>1</sub>-C<sub>6</sub> alkyl, hydroxyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, -CHO, -COOH, -CN, -CO<sub>2</sub>R<sub>14</sub>, -CONHR<sub>14</sub> and -CONR<sub>14</sub>R<sub>15</sub> groups, -NHCOR<sub>14</sub> and -NR<sub>14</sub>R<sub>15</sub> groups in which R<sub>14</sub> and R<sub>15</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>6</sub>) alkyl and -CH<sub>2</sub>-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,

-phenyl-CO-CH<sub>3</sub> or -phenyl-CO-CH=CH-N(CH<sub>3</sub>)<sub>2</sub>, morpholino, nitro or SO<sub>3</sub>H groups, groups:



R<sub>16</sub> and R<sub>17</sub> being chosen from C<sub>1</sub>-C<sub>6</sub> alkyl groups and Ar being a C<sub>6</sub>-C<sub>14</sub> aryl group,

with the exclusion of the compounds in which X = O, and, either : R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H, or : R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>2</sub> = Br, or R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>5</sub> = OH,

and the addition salts of these compounds with pharmaceutically acceptable acids.

3. The pharmaceutical composition as claimed in claim 2, comprising an effective amount of a compound chosen from the compounds of formula I in which:
- X represents oxygen,
  - $R_1$  is chosen from hydrogen and an amino group,
  - $R_2$  is chosen from hydrogen and halogens,
  - $R_3$  is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, methyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenylalkyl, -(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub>, -(CH<sub>2</sub>)<sub>2</sub>-O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,
  - $R_4$  is chosen from hydrogen, halogens and nitro and amino groups,
  - $R_5$ ,  $R_6$  and  $R_7$  represent a hydrogen, with the exclusion of the compounds in which  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$ ,  $R_7$  = H, or  $R_1$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$ ,  $R_7$  = H and  $R_2$  = Br,
- and the addition salts of these compounds with pharmaceutically acceptable acids.

4. The pharmaceutical composition as claimed in claim 1, comprising an effective amount of a compound chosen from the compounds of formulae I and Ia in which:
- X represents oxygen,
  - $R_1$  is chosen from hydrogen and an amino group,
  - $R_2$  is chosen from hydrogen and halogens,
  - $R_3$  is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, methyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenylalkyl groups and groups -(CH<sub>2</sub>)<sub>n</sub>-Y with Y being chosen from halogens and groups CN, -CH(O-Et)<sub>2</sub>, (C<sub>1</sub>-C<sub>6</sub>) alkoxy, -O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> and -N(CH<sub>3</sub>)<sub>2</sub> and n = 1 to 3,

- 61 -

- R<sub>4</sub> is chosen from hydrogen, halogens, and nitro and amino groups,

- R<sub>5</sub> is chosen from a hydrogen, a halogen and a methoxy group,

5        - R<sub>6</sub> and R<sub>7</sub> are chosen from hydrogen and C<sub>1</sub>-C<sub>6</sub> alkoxy, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)alkyl and -CH<sub>2</sub>OCOCH<sub>3</sub> groups,

10        with the exclusion of the compounds of formula I in which R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H or R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>2</sub> = Br, and of the compound of formula Ia in which R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H,

15        and the addition salts of these compounds with pharmaceutically acceptable acids.

5. The composition as claimed in claim 4, in which the compounds are chosen from:

20        5-(dimethylamino)-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

20        5-(benzylamino)-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

5-bromo-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

25        7-amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

5-amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

5-methyl-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

30        10-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

5-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

35        7-nitro-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

5-chloro-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

- 5-bromo-10-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-(dimethylamino-2-ethyl)amino-9H-quino[4,3,2-de]-  
 [1,10]phenanthrolin-9-one,  
 5 5-bis(2-chloroethyl)amino-9H-quino[4,3,2-de]-  
 [1,10]phenanthrolin-9-one,  
 5-(2-chloroethyl)amino-9H-quino[4,3,2-de][1,10]-  
 phenanthrolin-9-one,  
 12-methoxy-9-H-quino[4,3,2-de][1,10]phenanthrolin-  
 10 9-one,  
 4-bromo-5-amino-9-H-quino[4,3,2-de][1,10]phenan-  
 throlin-9-one,  
 11-acetoxymethyl-9-H-quino[4,3,2-de][1,10]phenan-  
 throlin-9-one,  
 15 5-bromo-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-  
 one,  
 5-amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-  
 one,  
 5-(dimethylamino-2-ethyl)amino-9-H-quino[4,3,2-  
 20 de][1,7]phenanthrolin-9-one,  
 5-bis(chloroethylamino-2-ethyl)amino-9-H-quino-  
 [4,3,2-de][1,7]phenanthrolin-9-one,  
 5-(chloroethylamino-2-ethyl)amino-9-H-quino[4,3,2-  
 de][1,7]phenanthrolin-9-one,  
 25 4-bromo-5-amino-9-H-quino[4,3,2-de][1,7]phenan-  
 throlin-9-one,  
 7-nitro-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-  
 one,  
 7-amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-  
 30 one,  
 12-methoxy-9-H-quino[4,3,2-de][1,7]phenanthrolin-  
 9-one,  
 and the addition salts thereof with  
 pharmaceutically acceptable acids.

35

Sub  
All

The use of a compound as defined in one of claims  
 1 to 5, for the manufacture of an anticancer drug.

7. The use as claimed in claim 6, in which the compounds are chosen from:
- 5- (dimethylamino) -9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5 5- (benzylamino) -9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5-bromo-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 7-amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 10 5-amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5-methyl-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 15 10-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 7-nitro-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 20 5-chloro-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5-bromo-10-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 25 5- (dimethylamino-2-ethyl) amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5-bis (2-chloroethyl) amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5- (2-chloroethyl) amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 30 12-methoxy-9-H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 4-bromo-5-amino-9-H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 35 11-acetoxymethyl-9-H-quino[4,3,2-de][1,10]phenanthrolin-9-one,
- 5-bromo-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

5-amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

5-(dimethylamino-2-ethyl)amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

5-bis(chloroethylamino-2-ethyl)amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

5-(chloroethylamino-2-ethyl)amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

4-bromo-5-amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

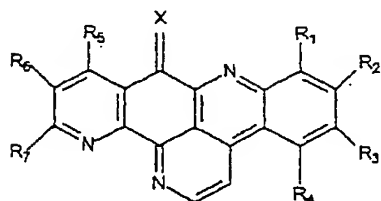
7-nitro-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

7-amino-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

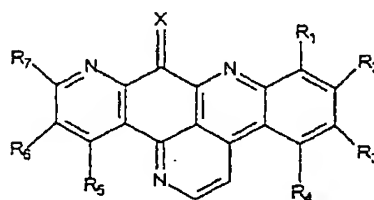
12-methoxy-9-H-quino[4,3,2-de][1,7]phenanthrolin-9-one,

and the addition salts thereof with pharmaceutically acceptable acids.

8. Compounds of general formulae I and Ia



Formula I



Formula Ia

in which:

- X is chosen from oxygen, an =NH group and an =N-OH group,

- R<sub>1</sub> is chosen from hydrogen, halogens, a nitro group and groups -NR<sub>8</sub>R<sub>9</sub> in which R<sub>8</sub> and R<sub>9</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,

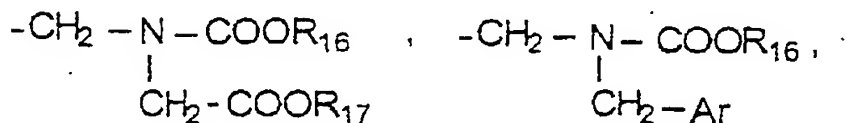
- R<sub>2</sub> is chosen from hydrogen and halogens,

- R<sub>3</sub> is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a



guanidino group, groups  $-NR_{10}R_{11}$  in which  $R_{10}$  and  $R_{11}$  are chosen, independently of each other, from hydrogen,  $(C_1-C_4)$  alkyl groups,  $(C_1-C_4)$  phenylalkyl groups and groups  $-(CH_2)_n-Y$  with  $Y$  being chosen from halogens and  $CN$ ,  $-CH(O-Et)_2$ ,  $(C_1-C_6)$  alkoxy,  $-O-(CH_2)_2-N(CH_3)_2$  and  $-N(CH_3)_2$  groups and  $n = 1$  to  $3$ ,  
 5  $R_4$  is chosen from hydrogen, halogens, nitro groups and groups  $-NR_{12}R_{13}$  in which  $R_{12}$  and  $R_{13}$  are chosen, independently of each other, from  
 10 hydrogen and  $(C_1-C_4)$  alkyl groups,

$R_5$ ,  $R_6$  and  $R_7$  are chosen from:  
 hydrogen or a halogen atom,  
 $C_1-C_6$  alkyl, hydroxyl,  $C_1-C_6$  alkoxy,  
 $(C_1-C_6)$  alkoxy  $(C_1-C_6)$  alkyl,  $(C_1-C_4)$  alkylcarbonyloxy-  
 15  $(C_1-C_4)$  alkyl,  $-CHO$ ,  $-COOH$ ,  $-CN$ ,  $-CO_2R_{14}$ ,  $-CONHR_{14}$   
 and  $-CONR_{14}R_{15}$  groups,  $-NHCOR_{14}$  and  $-NR_{14}R_{15}$  in which  
 $R_{14}$  and  $R_{15}$  are chosen, independently of each other, from hydrogen and  $(C_1-C_6)$  alkyl,  $-phenyl-CO-CH_3$  and  $-CH_2-CH_2-N(CH_3)_2$  groups,  
 20  $-phenyl-CO-CH_3$  or  $-phenyl-CO-CH=CH-N(CH_3)_2$ , morpholino, nitro or  $SO_3H$  groups,  
 groups:



25  $R_{16}$  and  $R_{17}$  being chosen from  $C_1-C_6$  alkyl groups and  $Ar$  being a  $C_6-C_{14}$  aryl group,  
 with the exclusion of the compounds of formula I  
 in which  $X = O$ , and, either  $R_1, R_2, R_3, R_4, R_5, R_6,$   
 30  $R_7 = H$ , or  $R_1, R_3, R_4, R_5, R_6, R_7 = H$  and  $R_2 = Br$ , or  
 $R_1, R_2, R_4, R_5, R_6, R_7 = H$  and  $R_3 = OCH_3$ , or  $R_1, R_2,$   
 $R_3, R_4, R_6, R_7 = H$  and  $R_5 = OH$  or  $OCH_3$ , or  $R_1 = NO_2$   
 and  $R_2, R_3, R_4, R_5, R_6, R_7 = H$ ,  
 and with the exclusion of the compound formula Ia  
 35 in which  $X = O$  and  $R_1, R_2, R_3, R_4, R_5, R_6, R_7 = H$ ,

- 66 -

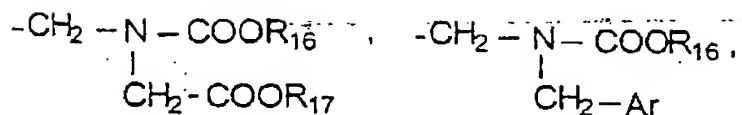
and the addition salts of these compounds with pharmaceutically acceptable acids.

9. Compounds as claimed in claim 8, of formula I in which:

- X is chosen from oxygen, an =NH group and an =N-OH group,
- R<sub>1</sub> is chosen from hydrogen, halogens, a nitro group and groups -NR<sub>8</sub>R<sub>9</sub> in which R<sub>8</sub> and R<sub>9</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,
- R<sub>2</sub> is chosen from hydrogen and halogens,
- R<sub>3</sub> is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenylalkyl, -(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub>, and -(CH<sub>2</sub>)<sub>2</sub>-O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,
- R<sub>4</sub> is chosen from hydrogen, halogens, nitro groups and groups -NR<sub>12</sub>R<sub>13</sub> in which R<sub>12</sub> and R<sub>13</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,
- R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are chosen from:
  - hydrogen or a halogen atom,
  - C<sub>1</sub>-C<sub>6</sub> alkyl, hydroxyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, -CHO, -COOH, -CN, -CO<sub>2</sub>R<sub>14</sub>, -CONHR<sub>14</sub> and -CONR<sub>14</sub>R<sub>15</sub> groups, -NHCOR<sub>14</sub> and -NR<sub>14</sub>R<sub>15</sub> in which R<sub>14</sub> and R<sub>15</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>6</sub>) alkyl and -CH<sub>2</sub>-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,
  - phenyl-CO-CH<sub>3</sub> or -phenyl-CO-CH=CH-N(CH<sub>3</sub>)<sub>2</sub>, morpholino, nitro or SO<sub>3</sub>H groups,

groups:

- 67 -



5  $R_{16}$  and  $R_{17}$  being chosen from  $C_1$ - $C_6$  alkyl groups and  
 Ar being a  $C_6$ - $C_{14}$  aryl group,  
 with the exclusion of the compounds in which  
 X = O, and, either  $R_1, R_2, R_3, R_4, R_5, R_6, R_7 = H$ ,  
 or  $R_1, R_3, R_4, R_5, R_6, R_7 = H$  and  $R_2 = Br$ , or  $R_1, R_2,$   
 $R_4, R_5, R_6, R_7 = H$  and  $R_3 = OCH_3$ , or  $R_1, R_2, R_3, R_4,$   
 $R_6, R_7 = H$  and  $R_5 = OH$  or  $OCH_3$ , or  $R_1 = NO_2$  and  $R_2,$   
 10  $R_3, R_4, R_5, R_6, R_7 = H$ ,  
 and the addition salts thereof with  
 pharmaceutically acceptable acids.

10. Compounds as claimed in claim 8, which are:  
 15 5-(dimethylamino)-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-(benzylamino)-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-bromo-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 20 7-amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-methyl-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-chloro-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 5-bromo-10-methoxy-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 25 5-(dimethylamino-2-ethyl) amino-9H-quino[4,3,2-de][1,10]-phenanthrolin-9-one,  
 5-bis(2-chloroethyl) amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 30 5-(2-chloroethyl) amino-9H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 12-methoxy-9-H-quino[4,3,2-de][1,10]phenanthrolin-9-one,  
 4-bromo-5-amino-9-H-quino[4,3,2-de][1,10]phenanthrolin-9-one,

AMENDED SHEET

11-acetoxymethyl-9-H-quinol[4,3,2-de][1,10]phenanthroline-9-one,  
 5-bromo-9-H-quinol[4,3,2-de][1,7]phenanthroline-9-one,  
 5-amino-9-H-quinol[4,3,2-de][1,7]phenanthroline-9-one,  
 5-(dimethylamino-2-ethyl)amino-9-H-quinol[4,3,2-de]-  
 [1,7]phenanthroline-9-one,  
 5-bis(chloroethylamino-2-ethyl)amino-9-H-quinol[4,3,2-de]-  
 [1,7]phenanthroline-9-one,  
 5-(chloroethylamino-2-ethyl)amino-9-H-quinol[4,3,2-de]-  
 [1,7]phenanthroline-9-one,  
 4-bromo-5-amino-9-H-quinol[4,3,2-de][1,7]phenanthroline-9-one,  
 7-nitro-9-H-quinol[4,3,2-de][1,7]phenanthroline-9-one,  
 7-amino-9-H-quinol[4,3,2-de][1,7]phenanthroline-9-one,  
 12-methoxy-9-H-quinol[4,3,2-de][1,7]phenanthroline-9-one,  
 and the addition salts thereof with pharmaceutically acceptable acids.

11. A process for preparing a compound of formula Ia,  
 in which:

- X is chosen from oxygen, an =NH group and an =N-OH group,
- R<sub>1</sub> is chosen from hydrogen, halogens, a nitro group and groups -NR<sub>8</sub>R<sub>9</sub> in which R<sub>8</sub> and R<sub>9</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,
- R<sub>2</sub> is chosen from hydrogen and halogens,
- R<sub>3</sub> is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenylalkyl groups and groups -(CH<sub>2</sub>)<sub>n</sub>-Y with Y being chosen from halogens and CN, -CH(O-Et)<sub>2</sub>, (C<sub>1</sub>-C<sub>6</sub>) alkoxy, -O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> and -N(CH<sub>3</sub>)<sub>2</sub> groups and n = 1 to 3,
- R<sub>4</sub> is chosen from hydrogen, halogens, nitro groups and groups -NR<sub>12</sub>R<sub>13</sub> in which R<sub>12</sub> and R<sub>13</sub>

- 69 -

are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,

- R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are chosen from:

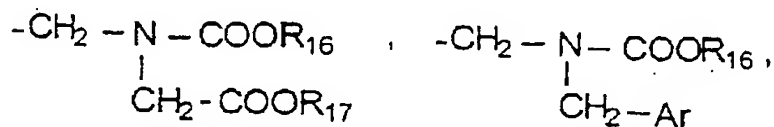
hydrogen or a halogen atom,

5 C<sub>1</sub>-C<sub>6</sub> alkyl, hydroxyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, (C<sub>1</sub>-C<sub>6</sub>)alkoxy(C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyloxy-(C<sub>1</sub>-C<sub>4</sub>)alkyl, -CHO, -COOH, -CN, -CO<sub>2</sub>R<sub>14</sub>, -CONHR<sub>14</sub> and -CONR<sub>14</sub>R<sub>15</sub> groups, -NHCOR<sub>14</sub> and -NR<sub>14</sub>R<sub>15</sub> in which R<sub>14</sub> and R<sub>15</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>6</sub>) alkyl, -phenyl-CO-CH<sub>3</sub> and -CH<sub>2</sub>-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,

10 -phenyl-CO-CH<sub>3</sub> or -phenyl-CO-CH=CH-N(CH<sub>3</sub>)<sub>2</sub>, morpholino, nitro or SO<sub>3</sub>H groups,

groups:

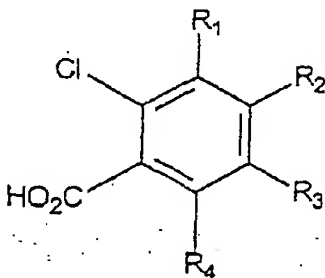
15



R<sub>16</sub> and R<sub>17</sub> being chosen from C<sub>1</sub>-C<sub>6</sub> alkyl groups and Ar being a C<sub>6</sub>-C<sub>14</sub> aryl group, which consists in:

20

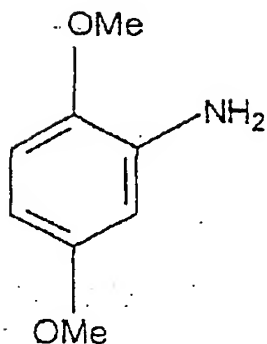
a - condensing a chlorobenzoic acid of formula:



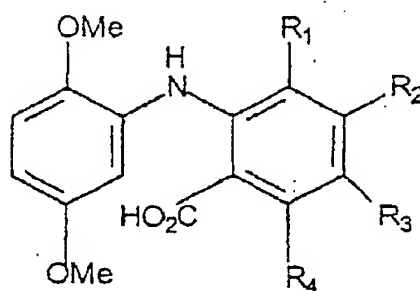
25

with a dimethoxyaniline of formula:

- 70 -

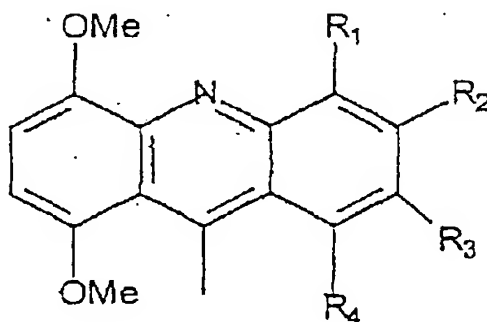


to give a compound of formula IIa:



5

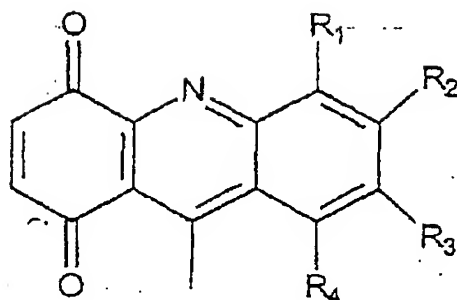
b - cyclizing the compound of formula IIa to give a compound of formula:



10

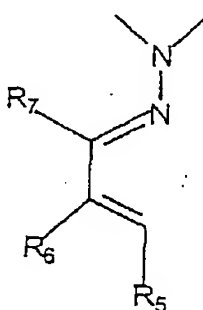
c - converting the compound into a quinone of formula IIIa:

- 71 -

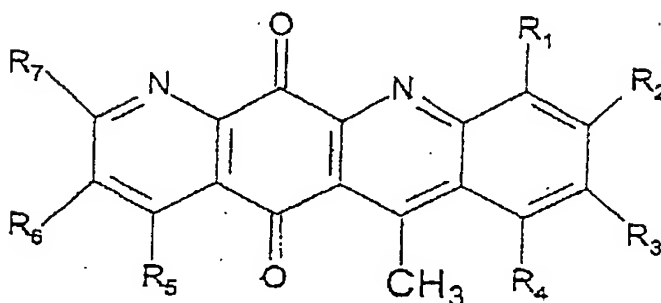


d - reacting the quinone of formula IIIa with an azadiene of formula:

5



to give a compound of formula IVa:



10

e - reacting the compound of the formula IVa with dimethylformamide diethyl acetal to give the compound of formula Ia,

15

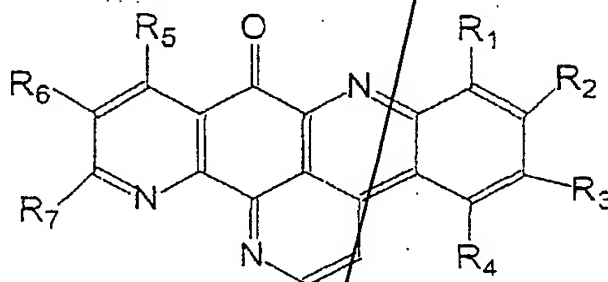
f - and, optionally, converting the compound thus obtained into another compound of formula Ia.

AMENDED SHEET

12. A process for treating patients having a cancer tumor, which consists in administering an effective amount of a compound as defined in claim 1.

5

13. A process for preparing compounds of general formula I, of formula:



10

in which:

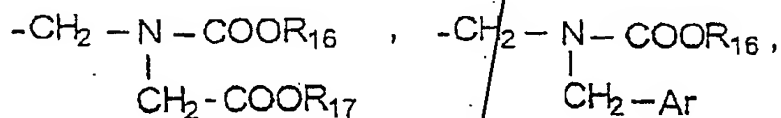
- R<sub>1</sub> is chosen from hydrogen, halogens, a nitro group and groups -NR<sub>8</sub>R<sub>9</sub> in which R<sub>8</sub> and R<sub>9</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,
- R<sub>2</sub> is chosen from hydrogen and halogens,
- R<sub>3</sub> is chosen from hydrogen, halogens, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>6</sub>) alkoxy groups, a guanidino group, groups -NR<sub>10</sub>R<sub>11</sub> in which R<sub>10</sub> and R<sub>11</sub> are chosen, independently of each other, from hydrogen, (C<sub>1</sub>-C<sub>4</sub>) alkyl groups, (C<sub>1</sub>-C<sub>4</sub>) phenylalkyl groups and groups -(CH<sub>2</sub>)<sub>n</sub>-Y with Y being chosen from halogens and CN, -CH(O-Et)<sub>2</sub>, (C<sub>1</sub>-C<sub>6</sub>) alkoxy, -O-(CH<sub>2</sub>)<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups and -N(CH<sub>3</sub>)<sub>2</sub> and n = 1 to 3,
- R<sub>4</sub> is chosen from hydrogen, halogens, nitro groups and groups -NR<sub>12</sub>R<sub>13</sub> in which R<sub>12</sub> and R<sub>13</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>4</sub>) alkyl groups,
- R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are chosen from:  
hydrogen or a halogen atom,

30



- 73 -

5 C<sub>1</sub>-C<sub>6</sub> alkyl, hydroxyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, (C<sub>1</sub>-C<sub>6</sub>)alkoxy (C<sub>1</sub>-C<sub>6</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyloxy- (C<sub>1</sub>-C<sub>4</sub>)alkyl, -CHO, -COOH, -CN, -CO<sub>2</sub>R<sub>14</sub>, -CONHR<sub>14</sub> and -CONR<sub>14</sub>R<sub>15</sub> groups, -NHCOR<sub>14</sub> and -NR<sub>14</sub>R<sub>15</sub> in which R<sub>14</sub> and R<sub>15</sub> are chosen, independently of each other, from hydrogen and (C<sub>1</sub>-C<sub>6</sub>) alkyl, -phenyl-CO-CH<sub>3</sub> and -CH<sub>2</sub>-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups, -phenyl-CO-CH<sub>3</sub> or -phenyl-CO-CH=CH-N(CH<sub>3</sub>)<sub>2</sub>, morpholino, nitro or SO<sub>3</sub>H groups, groups:

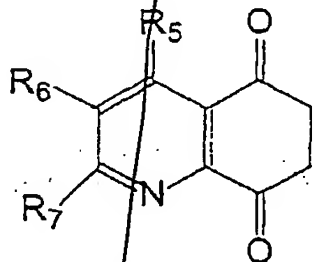


15 R<sub>16</sub> and R<sub>17</sub> being chosen from C<sub>1</sub>-C<sub>6</sub> alkyl groups and Ar being a C<sub>6</sub>-C<sub>14</sub> aryl group,

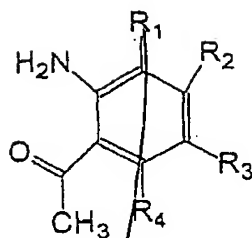
with the exclusion of the compounds of formula I in which either R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H, or R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>2</sub> = Br, or R<sub>1</sub>, R<sub>2</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>3</sub> = OCH<sub>3</sub>, or R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>5</sub> = OH or OCH<sub>3</sub> or R<sub>1</sub> = NO<sub>2</sub> and R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H,

which consists

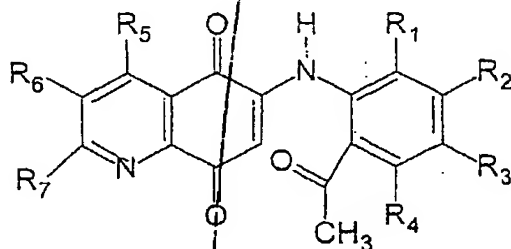
a) in reacting a hydroquinone of formula



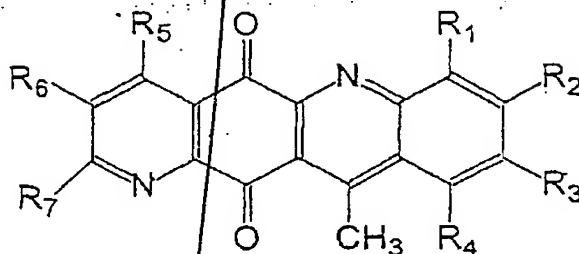
with a compound of formula



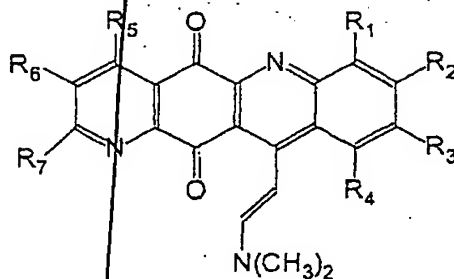
in the presence of  $CeCl_3$ ,  $7H_2O$  and ethanol to give a compound of formula II



b) in converting the compound of formula II into a compound of formula III



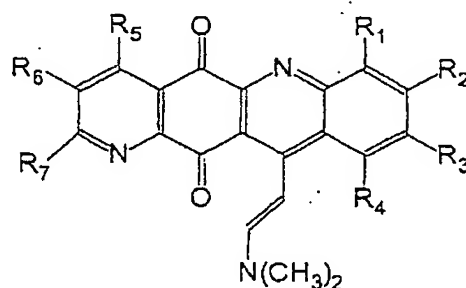
c) in reacting the compound of the formula III with  $HC(OC_2H_5)_2N(CH_3)_2$  in DMF at  $120^\circ C$  to form a compound of formula IV



d) in cyclizing the compound of formula IV to a compound of formula I in the presence of  $\text{NH}_4\text{Cl}$  and  $\text{AcOH}$ ,

e) optionally converting the compound of formula I thus obtained into another compound of formula II.

10 14. A compound of formula



in which:

15 -  $R_1$  is chosen from hydrogen, halogens, a nitro group and groups  $-\text{NR}_8\text{R}_9$  in which  $R_8$  and  $R_9$  are chosen, independently of each other, from hydrogen and  $(\text{C}_1\text{-C}_4)$  alkyl groups,

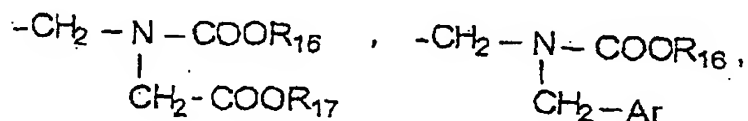
-  $R_2$  is chosen from hydrogen and halogens,

20 -  $R_3$  is chosen from hydrogen, halogens,  $(\text{C}_1\text{-C}_4)$  alkyl groups,  $(\text{C}_1\text{-C}_6)$  alkoxy groups, a guanidino group, groups  $-\text{NR}_{10}\text{R}_{11}$  in which  $R_{10}$  and  $R_{11}$  are chosen, independently of each other, from hydrogen,  $(\text{C}_1\text{-C}_4)$  alkyl groups,  $(\text{C}_1\text{-C}_4)$  phenylalkyl groups and groups  $-(\text{CH}_2)_n\text{-Y}$  with  $Y$  being chosen from halogens and  $\text{CN}$ ,  $-\text{CH}(\text{O-Et})_2$ ,  $(\text{C}_1\text{-C}_6)$  alkoxy,  $-\text{O}-(\text{CH}_2)_2\text{-N}(\text{CH}_3)_2$  and  $-\text{N}(\text{CH}_3)_2$  groups and  $n = 1$  to  $3$ ,

25 -  $R_4$  is chosen from hydrogen, halogens, nitro groups and groups  $-\text{NR}_{12}\text{R}_{13}$  in which  $R_{12}$  and  $R_{13}$  are chosen, independently of each other, from hydrogen and  $(\text{C}_1\text{-C}_4)$  alkyl groups,

30 -  $R_5$ ,  $R_6$  and  $R_7$  are chosen from:

hydrogen or a halogen atom,  
 $C_1-C_6$  alkyl, hydroxyl,  $C_1-C_6$  alkoxy,  
 $(C_1-C_6)$  alkoxy  $(C_1-C_6)$  alkyl,  $(C_1-C_4)$  alkylcarbonyloxy-  
 $(C_1-C_4)$  alkyl, -CHO, -COOH, -CN, -CO<sub>2</sub>R<sub>14</sub>, -CONHR<sub>14</sub>  
5 and -CONR<sub>14</sub>R<sub>15</sub> groups, -NHCOR<sub>14</sub> and -NR<sub>14</sub>R<sub>15</sub> in which  
R<sub>14</sub> and R<sub>15</sub> are chosen, independently of each  
other, from hydrogen and  $(C_1-C_6)$  alkyl, -phenyl-CO-  
CH<sub>3</sub> and -CH<sub>2</sub>-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> groups,  
-phenyl-CO-CH<sub>3</sub> or -phenyl-CO-CH=CH-  
10 N(CH<sub>3</sub>)<sub>2</sub>, morpholino, nitro or SO<sub>3</sub>H groups,  
groups:



15 R<sub>16</sub> and R<sub>17</sub> being chosen from  $C_1-C_6$  alkyl groups and  
Ar being a  $C_6-C_{14}$  aryl group,  
with the exclusion of compounds in which either  
R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H, or R<sub>1</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>,  
R<sub>7</sub> = H and R<sub>2</sub> = Br, or R<sub>1</sub>, R<sub>2</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H and  
20 R<sub>3</sub> = OCH<sub>3</sub>, or R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>6</sub>, R<sub>7</sub> = H and R<sub>5</sub> = OH  
or OCH<sub>3</sub> or R<sub>1</sub> = NO<sub>2</sub> and R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> = H,  
and the addition salts of these compounds with  
pharmaceutically acceptable acids.

*Added*